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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/752,534	12/29/2000	Manoj Khare	42390P9878	1416

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EXAMINER

PATEL, HETUL B

ART UNIT	PAPER NUMBER
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2186

DATE MAILED: 02/24/2004

10

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/752,534

Applicant(s)

KHARE ET AL

Examiner

Hetul Patel

Art Unit

2186

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 January 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Specification

1. This action is responsive to communication filed on January 05, 2004. This amendment has been entered and carefully considered. Claims 1-26 are again presented for examination.
2. The objection to the oath and declaration is withdrawn due to the Amendment filed January 05, 2004.
3. The objections to claims 5, 13 and 23 are withdrawn due to the Amendment filed January 05, 2004.
4. Applicant's arguments filed on January 05, 2004 have been fully considered but they are not deemed to be persuasive.
5. The rejection of claims 1-26 as in the Office Action mailed October 1, 2003 (paper number 7) is respectfully maintained and reiterated below for Applicant's convenience.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anderson et al. (USPN: 6,598,123), hereinafter, Anderson, in view of Witt (USPN: 5,623,627).

As per claims 1-6, Anderson discloses a method that comprises,

- maintaining a state by maintaining a presence vector, which indicates whether
 - o the first node has a copy of the contents (e.g. see column 3, lines 45-47); and
 - o the state is a shared state or an exclusive state (e.g. see column 3, lines 47-51).

However, Anderson does not disclose that his method comprising, in response to a request from a second node to access the contents, determining whether the state is an ambiguous state; and resolving the ambiguous state. Witt, on the other hand, in his teaching of computer memory architecture including a replacement cache, discloses a test method that comprises,

- in response to a request from a second node to access the contents, determining whether the state is an ambiguous state (e.g. see column 11, lines 4-5). As per definition of an ambiguous state given in the specification of this application, "an ambiguous state is a condition that identifies the last known state of the cache line at a member node that could have changed since last identified state". According to this definition, when the last known state of the member node is shared state and if the shared data is modified at

some other shared node, then the member node turns into ambiguous state;
and

- resolving the ambiguous state, which comprises
 - o snooping the first node for a current status of the cache line (e.g. see column 11, lines 4-5);
 - o receiving modified contents of the cache line and updating memory location designated for storing at least one of the contents, and the modified contents (e.g. see column 11, lines 5-9).

Accordingly, It would have been obvious to one of ordinary skill in the art at the time of the current invention was made to implement the method disclosed by Anderson, by adding two steps, determining and resolving the ambiguous state upon request to access the contents, as taught by Witt. In doing so, every modification made to the data on other/neighbor node will be broadcasted to other nodes and the main memory and therefore, data coherency is guaranteed and maintained throughout the system.

As per claim 9-14, see arguments with respect to the rejection of claims 1-6.

As per claim 16, Anderson teaches a shared memory multiprocessor system comprising a plurality of node controllers and a switch coupled to each of the plurality of node controllers (e.g. see Figure1 and column 1, lines 14-48), wherein the switch is programmed with instructions causing the switch (by using the snoop filter) to

- maintain a state of a cache line having contents last indicated by a first node controller of the plurality of node controllers (see arguments with respect to the rejection of claims 1-6);
- in response to a request from a second node to access the contents, determine whether the state is an ambiguous state (see arguments with respect to the rejection of claims 1-6); and
- resolve the ambiguous state (see arguments with respect to the rejection of claims 1-6).

As per claim 17-18, see arguments with respect to the rejection of claims 16 and 1-6.

As per claim 19-24, the combination of Anderson and Witt disclose the invention as claimed, detailed above with respect to claims 1-6; Anderson and Witt however do not particularly disclose a computer-readable medium of instructions to be implemented on a computer as being claimed in claims 1-6. However, one of ordinary skill in the art would have recognized that computer readable medium (i.e., floppy, cd-rom, etc.) carrying computer-executable instructions for implementing a method, because it would facilitate the transporting and installing of the method on other systems, is well-known in the art. For example, a copy of the Microsoft Windows can be installed onto other systems, which is a lot easier than running a long cable or hand tying the software onto another system. The examiner takes Official Notice of this teaching. Therefore, it would have been obvious to put Anderson and Witt's program on a computer readable

medium, because it would facilitate the transporting, installing and implementing of Anderson and Witt's program on other systems.

Further limitation of residing the memory location on a third node is embedded in the prior art taught by Anderson, in view of Witt. In the multi-node shared memory system, the nodes are inter-connected/networked with each other so the memory location can be resided on either requesting node, responding node or any other node (the "third node"), by this rationale, claims 7 and 25 are rejected.

Claims 8, 15 and 26 are also embedded in the method taught by Anderson, in view of Witt because once the determination of the state whether it is in ambiguous state or not, and resolving the ambiguous state completes, the request of accessing the cache line completes.

Remarks

7. As to the remark, Applicant asserted that "Neither Anderson, nor Witt, nor their combination, discloses, teaches, or suggests "determining whether the state is an ambiguous state" that is "in response to a request from a second node to access the cache line"" (page 9, lines 5 et seq.).

Examiner respectfully traverses Applicant's remark for the following reasons:

First of all, Examiner would like to emphasize that as stated in the abstract, the invention of Anderson is clearly related to and involved multi-node (multi-processor) system having a snoop filter that maintains a plurality of entries, each representing a cache line that may be owned by one or more nodes, i.e. a cache line

Art Unit: 2186

that may be in shared state or exclusive state to one or more nodes (emphasis added); for example, Anderson; in the detailed description section of his invention, and starting at column 3, lines 54 et seq.; clearly details that when a particular cache line is present only in (owned by) node 0, and now if the node 3 wants to access (to write data in it) that particular cache line (i.e. the request from a second node (node 3) to access the cache line has been received), then the snoop filter sends the invalid request to the node 0, and the node 3 receives the cache line in exclusive state. However, Anderson does not teach that the method comprises a step of determination of whether the state is an ambiguous state, in response to the request from a second node to access the cache line. Witt, on the other hand, teaches a microprocessor having two level cache memory architecture, i.e. the first level cache (30 in Fig. 2) and the replacement cache (60 in Fig. 2). Furthermore, Witt teaches that when the replacement cache wants to access (run the memory read or write operation) the memory, a test is conducted to determine whether the state is ambiguous state or not, i.e. by checking if the previous state was shared state or not. If the previous state was shared state, then it is in ambiguous state since the data at the other (primary) cache may have changed (emphasis added) (e.g. see from Col. 10, line 13 to Col. 11, line 14). Accordingly, it would have been obvious to one of ordinary skill in the art at the time of the current invention was made to add this test step taught by Witt in Anderson's multiprocessor system so every modification made to the data on other/neighbor node (processor) will be broadcasted to other nodes and the main memory and therefore, data coherency is guaranteed and maintained throughout the system.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

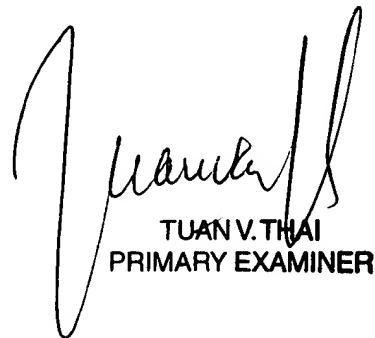
A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hetul Patel whose telephone number is (703) 305-6219. The examiner can normally be reached on M-F 8-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matt Kim can be reached on (703) 305-3821. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

HBP



TUAN V. THAI
PRIMARY EXAMINER